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EXTERNAL VS ENDONASAL DACRYOCYSTORHINOSTOMY A COMPARATIVE STUDY

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CERTIFICATE

This is to certify that the dissertation entitled, "**EXTERNAL VS ENDONASAL DACRYOCYSTORHINOSTOMY - A COMPARATIVE STUDY"** submitted by **Dr.ARUNA ARUMUGAM,** in partial fulfillment for the award of the degree of Master of Surgery in Ophthalmology by The Tamilnadu Dr.M.G.R.Medical University, Chennai is a bonafide record of the work done by her in the Regional Institute of Ophthalmology, Government Ophthalmic Hospital, Egmore, Chennai, during the academic year 2007 – 2010.

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CONTENTS

INTRODUCTION

There has always been the need for change since time immemorial, and the field of ophthalmology is no exception. As mankind strives for betterment of surgical technology and where sky is the limit , it is indeed human nature to expect the ultimate result with the least invasive microsurgical procedure and minimal trauma.

In this era of phacoemulsification and multifocal intraocular lenses in cataract surgery, can lacrimal surgery be far behind? As in cataract surgery, where phacoemulsification and multifocal intraocular lenses have revolutionized the world, so also in lacrimal surgery, the nasal endoscope has come to stay.

Since the time of Addeo Toti's traditional external dacryocystorhinostomy in 1904, using the skin incision, which has stood the test of time, to the present day endonasal dacryocystorhinostomy, lacrimal surgery has seen several modifications and improvements.

It was Dupuy Dutemps[2], (Fig 1), in 1921, who first used mucosal flaps in external DCR, while the endonasal approach was first described by Caldwell in 1893[5]. Argon laser DCR was first described by Massaro, Gonnering and Haeris in 1990. With every experience gained over the years, the success rates of DCR, both external and endonasal, have vastly improved, thanks to improvised equipment, investigations, suture materials and anaesthetic procedures.

ANATOMY OF THE LACRIMAL SYSTEM

EMBRYOLOGY

The lacrimal sac and the nasolacrimal duct develop from the cord of the surface ectodermal cells, which is separated from the surface during union of the lateral nasal and maxillary process at around the 5th week of intrauterine life (10 mm stage). By the 6 th week, the canaliculi grow into the lids from the upper end of this cord. Canalization of this solid column of cells takes place by degeneration and shedding of the cells which begins at the 3rd month and is completed just before birth (Fig. 5).

THE LACRIMAL PUNCTA

Two in number, the upper and lower puncta (0.2-0.3mm) rest on raised papilla, with a central opening leading to the canaliculi. The upper punctum is situated more medially than the lower, 6-6.5 mm from the medial canthus. They are directed posteriorly toward the globe and visible only when the eyelid margin is everted.

THE LACRIMAL CANALICULI

The upper and lower canaliculi, 0.5-2.0 mm in diameter and 10-12 mm long connect the puncta to the sac. The initial 2 mm is vertical, while the remaining medial part is horizontal, the intersection of the two forming the dilated ampulla. The canaliculi unite to form the common canaliculus (in 90%)

to open into the lacrimal sinus of Maier, a diverticulum present on the posterosuperior part of the lateral wall of the lacrimal sac, 2-3 mm below its apex. The common canaliculus lies directly beneath the central portion of the medial canthal tendon.

THE LACRIMAL SAC

The lacrimal sac lies in the lacrimal fossa formed by the frontal process of the maxilla and the lacrimal bone, in the anterior part of the medial orbital wall. Dimensions of the sac: 12-15 mm vertically, with a 3-5 mm fundus superiorly and 10 mm body, which is continuous inferiorly with the nasolacrimal duct (Fig. 2 and 3). The sac is enclosed by the periorbita, which splits at the posterior lacrimal crest and reunites at the anterior lacrimal crest, thus forming the lacrimal fascia, which is related to the medial palpebral ligament anteriorly and to the deep heads of the preseptal and pretarsal orbicularis muscle posteriorly (Horner' muscle[1]), thus forming a potential space to create the pressure needed for the functioning of the lacrimal pump. The floor of the lacrimal fossa is very thin in the area of the lacrimal bone and thicker at the posterior lacrimal crest. The orbital fat lies posterolateral to the sac and the angular vein crosses the anterior surface of the medial canthal tendon approximately 8 mm nasal to the medial canthus.

NASOLACRIMAL DUCT

12-18 mm long, the nasolacrimal duct connects the lower part of the sac wih the inferior nasal meatus. The longer intraosseous component is about 10-12 mm, while the shorter is the membranous meatal component, 3-5 mm long. The duct has an antero postero orientation of about 15 degrees, and it slopes laterally from top to bottom with a slight convexity, in keeping with the slope of the lateral nasal wall. It opens into the nose on the anterior part of the lateral nasal wall in the inferior meatus at the osteum lacrimale, approximately 10 mm posterior to the anterior end of the inferior turbinate and approximately 30 mm from the external nares.

VALVES

There are many valves in the membranous part, of which Krause's valve presents at upper end, Tallifer's and Hyrtl's at the middle, and the Hasner's at the lower end[6]. These valves prevent retrograde passage of air. Failure of complete canalization of the duct into the nasal meatus is due to the persistence of Hasner's membrane, which usually canalizes within the first few months of life.

NERVE SUPPLY AND VASCULAR SUPPLY

The infratrochlear branch and the anterior superior alveolar branch of the trigeminal nerve supply the lacrimal sac.

The vascular supply is derived from the ophthalmic artery- through the superior and inferior medial palpebral branches, facial artery through the angular branch and the infraorbital and sphenopalatine arteries.

Venous drainage is through the angular and infraorbital veins.

ANATOMY OF THE NOSE (Fig 4)

The lateral wall of the nose has three turbinates or conchae. Beneath each turbinate lies the meatus. The inferior receives drainage from the nasolacrimal duct only, at a point about one third of the way back from its anterior margin. The middle meatus receives drainage from the frontonasal duct and anterior ethmoidal cells anteriorly, from the middle ethmoidal cells and maxillary sinus ostium medially and from the posterior ethmoidal cells posteriorly. The middle meatus contains the uncinate process, hiatus semilunaris with the infundibulum, and bulla ethmoidalis. The uncinate (hook) is seen as a smooth mucosal elevation in the anterior part of the middle meatus. The sac and duct usually lie immediately anterior and lateral to it and it does not need to be disturbed during surgery[10]. Its superior posterior free margin borders the hiatus semilunaris, which leads to the infundibulum, into which the frontal, anterior ethmoid and maxillary sinuses drain. The superior turbinate is very small, located high and posterior, and cannot ordinarily be seen on clinical examination. The nasal septum may grow irregularly or may be deviated or traumatized so that it obstructs the sinus openings and sometimes the nasolacrimal duct opening.

PHYSIOLOGY OF THE LACRIMAL SYSTEM

TEAR SECRETION AND DRAINAGE

The anterior lipid layer is secreted from the meibomian glands, with some contribution from the glands of Zeis and Moll. The middle aqueous component is secreted by the lacrimal gland and the accessory glands of Krause and Wolfring. The inner mucin layer is secreted by the conjunctival goblet cells. Most of the tear secretion is drained by the lacrimal pump mechanism (75%), the remaining, by evaporation (25%).

According to the Rosengren-Doane lacrimal pump theory, blinking not only spreads the tear film over the cornea, but also moves tears towards puncta[11]. The pretarsal orbicularis encircles the horizontal part. When it contracts, it closes the ampulla and drains canaliculi into the sac. The posterior insertion of orbicularis in the fascia around the nasolacrimal duct sac pulls the lateral wall of sac laterally as orbicularis contracts thus creating a negative pressure, drawing the tears from common canaliculus. When the orbicularis relaxes (i.e. eye opens), the sac collapses driving tears into the nasolacrimalduct duct (Fig 6). The passage of tears down the nasolacrimal duct is influenced by gravity.

“Wringing out” mechanism, governed by a system of helically arranged fibrillar structures in the form of collagen and elastic fibres[13].

Epithelial secretion products (mucin and TFF peptides) of the epithelium of the lacrimal sac and nasolacrimal duct help in the prevention of dacryostenosis, dacryolithiasis and dacryocystitis, by their immunological response[13].

Opening and closing of the lumen of the lacrimal passage is also effected by the bulging and subsiding of the vascular system surrounding the sac and duct in the form of a cavernous body.

Thus, the lacrimal drainage system physiologically comprises of a canalicular pumping mechanism and lacrimal sac siphoning mechanism.

CAUSES OF A WATERING EYE

Watering or tearing is the most common ocular symptom seen in cases of lacrimal sac disorders. Tearing may be due to:

Hyper secretion , epiphora, or combined hypersecretion and epiphora.

In **hypersecretion,** watering occurs due to excessive tear production in the presence of normal excretory system of the lacrimal passage, while in **epiphora,** watering occurs secondary to abnormal excretory system in the presence of normal lacrimal secretion. It is important to differentiate the two conditions, as the management differs.

Hypersecretion may be:

Primary, Secondary or Paradoxical Gustatory

Primary hypersecretion may be due to:

Dacryoadenitis, lacrimal, parasympathetic stimulation , serotonin secretion in malignant carcinoid syndrome, hyperthyroidism or hypoparathyroidism.

Secondary hypersecretion may be due to:

Trichiasis, distichiasis, foreign body on the cornea and conjunctiva, keratitis, allergy, viral conjunctivitis, congenital glaucoma and uveitis.

Paradoxical gustatory, may be seen in

Crocodile tears, nasopharyngeal tumours and in reflex tearing as in laughing, yawning and vomiting.

EPIPHORA

May be due to:

An abnormal position of punctual opening as in ectropion, Centurion syndrome, defective pump failure as in facial palsy and obstruction to the excretory lacrimal passage from the puncta to the nasolacrimal duct opening under inferior concha at physiological valve of Hasner.

A. Punctal obstruction/canalicular obstruction

Congenital-absence, atresia

Traumatic-mechanical, chemical, irradiation

Infection-viral infections

Ciacatrising –causing eversion-steven-johnson syndrome

B. Lacrimal sac obstruction

Traumatic-LeFort II fracture, nasal and orbital surgeries

Infection-acute/chronic/recurrent dacryocystitis

Tumours-inverted papillomas, squamous cell carcinoma.

C. Nasolacrimal duct obstruction

Congenital-absence or atresia, lack of canalization

Traumatic-facial fractures, surgeries of nose, probing

Nasal pathology-polyps, antral carcinomas, inferior turbinate hypertrophy.

Idiopathic involutional stenosis of old age-commonest

Pseudo-nasolacrimal duct obstruction-secondary to nasal allergy-allergic rhinitis

CLINICAL APPROACH TO A PATIENT

WITH WATERING

HISTORY

TIME AND AGE OF ONSET

first few weeks of life	-	congenital nasolacrimal duct obstruction
young age	-	following trauma, viral infections
middle age	-	infections, dacryoliths(intermittent)
old age	-	idiopathic involutional nasolacrimal duct obstruction, infections.

DURATION: can be acute, sub-acute or chronic

FREQUENCY: constant or intermittent (dacryolith)

PRESENCE OF AGGRAVATING FACTORS -wind, cold, weather, sunlight

HEADACHE - refractive errors, iritis, glaucoma

LATERALITY - unilateral or bilateral (reflex hypersecretion)

ASSOCIATED PAIN - indicates dacryocystic retention-inflammatory

SWELLING IN THE REGION OF SAC - Acute or chronic dacryocystitis, mucocele, tumuours.

REGURGITATION ON PRESSURE OVER SAC REGION-lower obstruction.

INABILITY TO READ - increase in the tear lake.

PAST HISTORY

Similar complaint in the past- recurrent dacryocystitis, lacrimal abscess or fistula (Fig. 11 and 12).

History of injury- midfacial fractures, or surgeries of eye or nose.

Previous eye disease or prolonged application of topical medications.

Medical conditions: Bell's palsy, cerebrovascular accident.

Treatment with radiotherapy or chemotherapy.

PHYSICAL EXAMINATION

INSPECTION

Widening of palpebral fissure (facial palsy)

Developmental anomaly of lids-coloboma

Ectropion, entropion, trichiasis, or punctal eversion

Blepharitis, traumatic scars, excoriation of skin of lids-dermatitis

Senile skin laxity-poor lacrimal pump

Skin over the sac region- swelling, redness, fistula, mass

Increased tear meniscus, increased debris/mucus in tear film.

Regurgitation on pressure over sac region.

ASSESSMENT OF LID LAXITY

Snap-back test: pull the lower lid away from the globe-if it is retracted for more than 6 mm or does not snap back to its position quickly, indicates lid laxity.

Medial canthal tendon laxity: Assessed by the lateral distraction test by pulling the lower lid laterally and measuring the distance the lower punctum can be displaced along the horizontal line (normal upto 2-3 mm).

SLIT-LAMP EXAMINATION

To evaluate the diseases of lid margin, conjunctiva, cornea, anterior chamber that cause reflex tearing.

DIAGNOSTIC NASAL ENDOSCOPY

This is invaluable in the study of the anatomy of the nose, opening of the nasolacrimal duct and to assess the site of surgery in endonasal DCR. Useful in both pre and post operative conditions. It is important to assess the mucosal status and the presence of pathology (polyp, deviated septum, atrophic rhinitis), that may be responsible for intranasal obstruction of the nasolacrimal duct (Fig 17, 18 and 19).

CLINICAL DIAGNOSTIC TESTS

SECRETORY

SCHIRMER'S TEST

The amount of wetting on a strip 30 x 5mm No. 41 Whatmann filter paper over 5 minutes helps to assess tear production (FIG 13).

In the normal non anaesthetized eye - Under 40 yers (15mm wetting), over 40 years (10mm wetting)

In the normal anaesthetized eye - Under 40 years - (10mm wetting), over 40 years (5mm wetting).

TEAR FILM BREAK-UP TIME (BUT)

Here, deficiency of mucin layer, which spreads the tear, is detected. It is defined as the interval between a complete blink and the appearance of the first randomly distributed dry spot, when fluorescin 2% instilled in conjunctival sac is seen under slit lamp examination under cobalt blue illumination. Normal BUT is 15-35 seconds. If < 10 seconds, suggests mucin deficiency.

ROSE-BENGAL TEST

1% Rose Bengal strain is instilled into the conjuntival sac. It stains abnormal epithelial debris and mucin of conjunctiva especially in the inter palpebral area, indicating indirectly the measure of tear secretion.

EXCRETORY

DIAGNOSTIC PROBING AND LACRIMAL SYRINGING (Fig. 7 & 8)

First advocated by Dominique Anel in 1703[5]. In this procedure, under surface anaesthetia, lower, punctum is dilated with Nettleship's dilator [4]. The lacrimal irrigation cannula (G-23) , attached to a lacrimal syringe is inserted first vertically for 2mm, rotated 90 degree to insert 8mm horizontally and advanced through the canaliculus to the medial wall of the lacrimal sac fossa. If the cannula hits bone (hard stop), it implies that the canaliculus is open and the obstruction is probably in the sac or the duct. If it does not hit the bone, a 'soft stop' occurs, implying that the obstruction is probably in the common canaliculus. Clear water or saline is then gently irrigated through the cannula. If fluid passes into the nose without reflux from the opposite canaliculus, the system is totally patent. If fluid passes into the nose with resistance, with reflux occurring through the opposite canaliculus, it means that the system is anatomically patent, but physiologically stenotic (partially occluded). If no fluid passes into the nose, with complete regurgitation through either punctum, complete nasolacrimal duct obstruction is present.

DYE DISAPPEARANCE TEST

1 drop of fluroescin 2% is instilled into the conjuctival sac and the tear film observed with cobalt blue filter under the slit lamp. Asymmetrical clearance of dye from tear meniscus over a 5-minute period indicates a relative obstruction on the side retaining the dye.

Fluorescein dye disappearance test

Grading scale[9]

0 – no fluorescence in the conjunctival sac

1 – thin fluorescing marginal tear strip persists

2 – more fluorescein persists, between 1 and 3

3 – wide, brightly fluorescing tear strip

Grade 0 and 1 are considered normal, with good drainage function, while grade 2 and 3 are abnormal. This test is a simple and effective screening tool.

JONES FLUROESCEIN DYE TEST

This test is used to determine whether the lacrimal drainage system is fully patent or, if partially obstructed- the site of block- the upper system, or the lower system.

Jones 1 test : Fluorescein dye is instilled in the patient's conjunctval sac and a cotton tip is placed in the nose below the inferior turbinate as far as the nasolacrimal duct.

The test is positive if the dye is found on the cotton bud.

A positive Jones test indicates a patent system and normal physiologic function.

A negative test indicates three possibilities:

False-negative

Physiologic dysfunction

Anatomic obstruction

and a Jones 2 is recommended.

Jones 2 test: The patient's lacrimal drainage system is irrigated after a negative Jones I, and a transcanalicular irrigation with saline is done and the patient is asked to expel the fluid from the pharynx. Presence of dye indicates partial block at lower sac or duct. Presence of saline indicates punctal or canalicular stenosis.

HORNBLASS SACCHARINE TEST:

Saccharine drops are instilled in one eye and chloramphenicol eye drops in the other, several minutes later.

The ability of the patient to detect the sweet taste of the saccharine and the bitter taste of the chloramphenicol denotes a patent lacrimal system.

This is a simple and effective test useful in children.

IMAGING STUDIES – DACRYOCYSTOGRAPHY (Fig. 9)

It involves ingestion of radio opaque fluid into lower or upper canaliculus and taking magnified images. Semi functional information is obtained from late erect view.

Bilateral simultaneous DCG gives relative functional information, while digital subtraction DCG gives a high quality image.

Modified dacryocystography includes radiologic subtraction techniques and macrography (increasing image size). DCG is contraindicated in obvious regurgitating mucocoele and in acute dacryocystitis (painful).

NUCLEAR LACRIMAL SCINTIGRAPHY

Uses radiotracer Technitium 99 which is easily detectable[9]. A minute dose 5 – 10 mega becqurels / eye is used and Gamma camera recording of tracer activity done at intervals (Fig 10).

A safe physiological method, which does not require anesthesia and allows normal blinking.

Areas of interest: Pre sac, Sac - nasolacrimal duct junction, mid duct and infra duct .

COMPUTED TOMOGRAPHY

High resolution CT in axial and coronal plane is of use in cases of suspected tumour mass in the sac region, midfacial trauma and failed DCR.

ULTRASONOGRAPHY

May be of use in cases of common canalicular obstruction and in whom the sac cannot be demonstrated on DCG.

ULTRASOUND BIOMICROSCOPY

Resolution of the subsurface structures upto 4 mm helps in visualization of the canaliculi.

PATHOLOGY OF THE LACRIMAL SYSTEM

OBSTRUCTIONS OF THE LACRIMAL SAC AND DUCT

TYPES OF OBSTRUCTIONS

Congenital nasolacrimal duct obstruction **(CNLDO)**

Primary nasolacrimal duct obstruction **(PANDO)**

Secondary acquired lacrimal drainage obstruction **(SALDO[9])**

CONGENITAL NASOLACRIMAL DUCT OBSTRUCTION (CNLDO)

This is the commonest cause of childhood epiphora. It may be due to an imperforate membrane of the Hasner's valve,or stenosis of the opening from narrowed nasolacrimal duct or hypertrophied inferior nasal turbinate. It represents a delay in the maturation of the lacrimal system and nose. Spontaneous resolution is very rapid in the 1st year of life. Therefore probing is deferred till this age.

Probing is performed under general anaesthesia. Hard stop or Soft stop is ascertained[4]. Following this, topical antibiotics are used.

The success rates of probing are over 90%. If it fails, one should wait for 3 months before attempting another procedure, as most cases of seemingly failed probing resolve spontaneously. If repeat probing does not proceed easily then silastic tubes should be placed for at least 3 months, beyond which dacryocystorhinostomy is performed at a later date (3 years).

ACQUIRED OBSTRUCTIONS

PRIMARY ACQUIRED NASOLACRIMAL DUCT OBSTRUCTION

First described by Lindberg in 1986. It is the most common cause of eiphora in adults.

PATHOGENESIS

Chronic mucosal thickening with progressive fibrosis[17] leading to narrowing of the nasolacrimal duct along with increased venous stasis within the venous sinusoids around the nasolacrimal duct.

SECONDARY ACQUIRED LACRIMAL DRAINAGE OBSTRUCTION (SALDO)

Term given by Bartley in 1992 to cover the wide range of secondary causes of epiphora from infection, inflammation, neoplasia, trauma and mechanical causes

INFLAMMATORY: sarcoidosis, wegener's granulomatosis

INFECTIOUS; staphylococcus, streptococcus, pseudomonas, actinomycosis, tuberculosis, Hansens.

TRAUMATIC: fractures midface, rhinoplasty

NEOPLASM: primary lacrimal sac tumours

DACRYOCYSTITIS

SUB-TYPES

Subacute - tender , non reducible mucocele with a moderately inflamed wall.

Acute- painful enlarged lacrimal sac containing mucus and pus. The inflamed sac expands anteriorly, inferorly or laterally due to its position in the lacrimal fossa anterior to the orbital septum and the pus tracks to the skin surface.

Chronic – recurrent attacks of acute dacryocystitis leads to chronic dacryocystitis ,often with acquired fistula from the sac to the skin,below the medial canthal tendon.

APPROACH TO A PATIENT WITH CHRONIC DACRYOCYSTITIS

HISTORY

SYMPTOMS

Epiphora, discharge (mucoid or purulent), swelling medial canthus, epistaxis (nasal, sinus, lacrimal sac tumour).

PAST HISTORY

Previous surgery (DCR/Sinus surgery), medication usage, previous radiation treatment, midfacial trauma.

CLINICAL EXAMINATION

MUCOID OR PURULENT EYE DISCHARGE, overflow of tears, mass over the sac area.

REGURGITATION TEST- ROPLAS test - mucoid reflux with lacrimal massage indicates lower system obstruction. (Fig. 13 & 14).

SLIT LAMP EXAMINATION –for assessment of

Tear meniscus height , punctual stenosis or pouting, canaliculitis characterised by canalicular fullness and creamy pus on canalicular pressure and expression of concretions from punctum.

INVESTIGATIONS

LABORATORY INVESTIGATIONS

Lacrimal discharge for Gram and Giemsa stain, and culture and sensitivity, KOH stain(suspected fungal infection) and anticytoplasmic antibodies (Wegener's granulomatosis)

IMAGING STUDIES

Dacryocystography to locate anatomical level of block, Dacryoscintigraphy to locate functional level of block and computed tomography in trauma and sinonasal pathology.

DIAGNOSTIC NASAL ENDOSCOPY to rule out nasal pathology

OTHER TESTS

Schirmer's test

TREATMENT

Is essentially surgical. However, broad spectrm oral antibiotic is useful in subacute and acute dacryocystitis, followed by dacryocystorhinostomy 2 to 3 weeks later. Hot fomentation may help in resolution of the disease. External or endonasal DCR is indicated in chronic dacryocystitis.

The success rates of surgery range from over 95% in external DCR to about 85- 90% in endonasal DCR and around 65-70% in laser assisted DCR using carbon dioxide or KTP laser.

RECENT ADVANCES IN LACRIMAL SURGERY[9].

Botulinum Toxin injection for the treatment of crocodile tears.

Silicone punctual plugs to increase tear retention in facial palsy or severe dry eye.

Transcanalicular laser canaliculoplasty and dacryocystorhinostomy [29] using a modified lacrimal endoscope.

Nasolacrimal duct intubation using Ritleng Tubes, Hausler Tubes or Nunchaku Tubes

Transcanalicular Balloon dacryoplasty is used for nasolacimal duct dilatation in patients with circumscribed focal stenoses or occlusions of the NLD and is contraindicated in acute dacryocystitis.

EXTERNAL DACRYOCYSTORHINOSTOMY

The gold standard of lacrimal bypass surgeries with success rates of over 95%, it facilitates identification and removal of dacryoliths and lacrimal sac tumors and allows for biopsy of lacrimal sac. It creates a communication between the lacrimal sac and nasal cavity, bypassing the obstructed nasolacrimal duct. It requires skin incision.

HISTORY

The origin of Dacryocystorhinostomy dates back from the time of Celsus,in the first century of the Christian era. Galen in the second century, also employed surgery to create a new passageway from the lacrimal sac into the nose. Anel in the 1700s was the first to irrigate the lacrimal duct for this symptom of obstruction. Bowman[5] in the 1800s later reported the technique of actually putting a probe through the duct to relieve obstruction of the nasolacrimal system.

Modern surgery of the lacrimal sac began in Italy , in1904,with Toti's description of an operation which involved (a) creation of an opening into the nasal wall with hammer and chisel and (b) removal of the nasal mucosa in this opening and the medial half of the lacrimal sac.

In 1922, Dupuy-Dutemp and Bourguet modified the Toti technique by dissecting the anterior and posterior flaps of the nasal and lacrimal mucosa and then suturing the flaps together with success rates ranging from 85-100%.

INDICATIONS

Mucocele, recent chronic dacryocystitis, NLD obstruction in young and middle aged and Primary acquired NLD obstruction.

CONTRA-INDICATONS

Atrophic rhinitis, pre-saccal obstruction, Rhinosporidiosis, acute dacryocystitis and lacrimal sac malignancies.

PROCEDURE

Anaesthesia

A general anaesthesia is preferred, but can be done under local anaesthesia. Local anaesthesia includes surface and infiltration anaesthesia. Topical xylocaine 4% along with two drops of adrenaline 1:5000 is instilled into the conjunctival sac at the medial canthus.

Xylocaine 2% with adrenaline is injected at the following sites:

At the junction of the inferior orbital margin with the beginning of anterior lacrimal crest, passed subcutaneously along the anterior lacrimal crest to a point 3mm above the medial palpebral tendon. Also directed posteriorly and slightly medially for a depth of 1cm, 0.5 ml is injected around the lateral wall of the sac.

The second injection is made at a point 3mm above the centre of medial palpebral tendon, directed posteriorly for about 8 mm and the tissues around the fundus of the sac are injected with 0.5 ml. The anterior ethmoidal foramen may be reached by a deeper injection along the medial orbital wall. The needle is then carried down and backwards to the upper half of the posterior lacrimal crest.

The anterior third of the middle meatus is sprayed with lignocaine 4% and adrenaline. An injection of lignocaine 0.5 ml with adrenaline is made through the mucoperiostium over the site corresponding to the lacrimal fossa so as to separate this structure from the underlying bone.

PROCEDURE

The head is fixed with the face turned slightly away from the side of operation. The eye is protected by a contact lens or gelatin sponge. The curved incision, conforming to the anterior lacrimal crest, which begins at the upper limit of the medial palpebral tendon, is deepened through the orbicularis muscle, so as to expose the entire anterior lacrimal crest.

The lacrimal fascia is incised 1 mm lateral to the anterior lacrimal crest and the bony attachment of the medial canthal ligament divided. The sac extends from the lacrimal fossa down to the opening of the nasolacrimal duct, and posteriorly, to the posterior lacrimal crest. A flat obtuse angled rectractor then retracts the sac. The periosteum is dissected from the lacrimal fossa . The ideal ostium is one which is at least 1 cm in diameter [18]. The thin bone of the posterior half of the lacrimal fossa is fractured by a blunt dissector inserted in

the suture line between lacrimal and maxillary bone. The elevator is then advanced and more mucoperiosteum is stripped from the nasal surface of the bone over an area 12.5x10mm with its long axis vertically, somewhat wider below than above with rounder edges. Adequate drainage from the new ostium into the nose should be effected by nibbling away anterior and medial walls. Other ways of making the ostium is by Stryker's saw or IIiff's trephine or electrical drill or with chisel and hammer[16].

A probe passed through the upper canaliculus indicates the position of the common canaliculus and the related part of the medial sac wall. A vertical cut is made with knife through the anterior wall of the sac. The medial wall is slit horizontally near the fundus of the sac and below. The nasal mucosa is incised horizontally in the upper and then the lower limit of the oval opening for its full diameter. These horizontal incisions are joined by a vertical incision which is made 4mm anterior to the posterior lacrimal crest, so that a large anterior flap of mucosa and a large posterior flap of sac is formed [24]. The corresponding flaps in the lacrimal sac and nasal mucosa is sutured with 6/0 polyglactin using 5/8 or ½ circle spatulated needles, passed 1.5mm from their cut edges. French rubber catheter or Crawford silicon tubes of 4-5mm diameter with absorbable sutures may also be used. The tube is removed after two weeks, when the sutures have become friable. The incision in the orbicularis muscle is closed with three interrupted 1.5 metric absorbable sutures, and the skin incision is closed by interrupted sutures of 7/0 black braided silk.

POST-OPERATIVE CARE

The first dressing is done after 24 hours. On the seventh day, the skin sutures are removed. Irrigation through the lower canaliculus is usually unnecessary, but may be done gently after the sixth day if clots are suspected to be causing obsruction or adhesion.

Antibiotic/steroid eye drops such as tobramycin/dexamethasone combination eye drops are prescribed postoperatively for use 2-3 times per day for 2-3 weeks as prophylaxis to infection and to decrease postoperative inflammation.

Nasal decongestant sprays are prescribed postoperatively for use 2-3 times per day for 2-3 weeks to decongest the nasal passage.

COMPLICATIONS

Dacryocystorhinostomy, when properly performed, is a very safe and effective procedure. However, as with all surgical procedures, complications can occur.

Hemorrhage is the most notable complication and has been reported to occur in less than 3% of patients.Bleeding is commonly encountered from the angular vessels, the nasal mucosa and occasionally from the anterior ethmoidal artery. Most cases of hemorrhage can be controlled with cotton pledgets soaked in thrombin. Rarely, nasal packing is needed. A posterior nasal pack is usually not required.

Infection - almost routinely, diabetics and children who undergo dacryocystorhinostomy are on postoperative oral antibiotics and antibiotics sprays. A “suture abscess” can be treated with removal of the offending suture, hot compresses and oral and topical antibiotics.

Cerebrospinal fluid leakage is the most dreaded complication of dacryocystorhinostomy. Because the cribiform plate lies just above the medial canthal tendon, tears in the bony plate with resultant CSF leakage can occur during creation of the osteotomy. Variations in anatomy are frequently responsible for the above complication.

Failure of the dacryocystorhinostomy is most commonly due to an inadequate osteotomy or due to fibrous closure at the surgical ostium. for which balloon dacryocystoplasty has been shown to be effective.

Canalicular stenosis: Intubation may be attempted but it is better to remove the stenotic portion and open the canaliculi directly into the middle meatus.

Corneal abrasion and infection.

Scarring: this occurs when the orbicularis muscle incision has not been sutured.

Telecanthus because of detachment of medial palpebral ligament.

ADVANTAGES

This procedure has success rates of over 95%, is economical and can be easily performed [26].

DISADVANTAGES

Due to the external scar which is not considered aesthetic, this procedure is not preferred in cosmetically oriented individuals. There is potential injury to adjacent medial canthal structures, relatively more bleeding and pain with significant post-operative morbidity.

ENDONASAL DACRYCYSTORHINOSTOMY

INTRODUCTION

Endoscopic or endonasal dacryocystorhinostomy [27] has come into vogue as an alternate method of treatment for nasolacrimal duct obstruction. Although pioneered by Caldwell in 1893, it was Rice, who modified the existing scenario of external DCR to endonasal DCR using endoscopic instruments to create the neo-ostium, leading to further advancement in the field since then.

The technique of endonasal-DCR was brought into light with the introduction of Functional Endoscopic Sinus Surgery[12] (FESS) by Messerklinger, who devised his own technique.

INDICATIONS OF FESS IN OPTHAMOLOGY

- Chronic dacryocystitis
- Exophthalmos-for medial wall decompression.
- Optic nerve injury –for optic nerve sheath fenestration
- Tumours of the orbit- biopsy, excision
- Inflammatory-extraperiosteal abscess
- Orbital floor fracture-diagnostic

INDICATIONS FOR ENDONASAL DCR

Lacrimal obstruction at the level of the sac or distal to sac, acute and chronic dacryocystitis, mucocele, failed external DCR.

CONTRA-INDICATIONS

Acute sinusitis/nasal polyposis, obstruction of the lacrimal canaliculi (pre saccal) and epiphora due to other non-obstructive causes

INSTRUMENTATION AND TECHNIQUES [16] (Fig. 16)

The instruments used are:

- Telescopes-(Hopkin's rigid endoscopes)-0 and 30 degree,4mm size.
- Telescope handles.
- Suction tips-straight and curved.
- Freer elevator.
- Cold light fountain and fibre-optic cable.
- Sickle knife.
- Forceps-blakesely-straight, upturned 90 degree & 45 degree.
- Video adapter with camera.
- T.V monitor.
- Antifog solution-savlon.

- Bipolar cautery.
- Long curved needle-26 gauge,1.5 inch with 1ml syringe.
- Kerrison punch forceps.
- Malleable probe and suction tips of different angles
- Ball probe.
- FESS scissors.

SELECTION OF PATIENTS

A careful preoperative evalution is mandatory, including intranasal endoscopy. The ideal patients' intranasal anatomy allows a clear view of the anterior portion of the middle turbinate with enough room for instrumentation. Endonasal DCR is avoided in patients with bleeding diathesis. Patients are warned that it may be necessary to convert to a standard DCR during the surgery, with the concomitant incision, edema and ecchymosis.

POSITION OF THE SURGEON (Fig. 15)

The surgeon sits or stands on the patients' right. The patient is in the supine position with head facing the examiner. If a second instrument is required, the endoscope is held between the thumb and forefinger of the left hand, which rests lightly on the cheek and the bridge of the nose of the patient[17] Before using the scope, it is dipped into an anti-fog solution (savlon) so that a thin film of solution remains over the lens to prevent fogging.

DIAGNOSTIC NASAL ENDOSCOPY

This is done after surface anesthesia of the nose with a pack of 4%lignocaine and oxymetazoline hydrochloride in equal parts, using soaked cotton pledgets for a period of 5-10mts.

This is performed in two passes.

In the first pass, the endoscope is passed along the floor of the nose inspecting the inferior turbinate, nasal septum and middle turbinate. Once the choana is reached, the eustachian tube orifice, fossa of Rosenmuller and the nasopharynx are visualised as either a small punctate or slit like opening at the junction of the anterior and middle thirds of the inferior turbinate[19].

The second pass is made along the middle meatus. The insertion of unicnate process can be identified by a shallow groove, which lies behind the lacrimal crest. The free edge of the uncinate may be visualized just above the inferior turbinate. Behind is the bony prominence called Bulla Ethmoidalis. Between these two structures is a groove called sulcus semilunaris which contains the infundibulum in the anterior part and opening of ethmoidal and maxillary sinuses [23].

Anaesthesia

Pre-operative packing with 4% Lignocaine 10ml+1ml Adrenaline cotton pledgets in the aggernasi area, middle meatus area, middle turbinate, inferior turbinate, inferior meatus area for 15-30 minutes, followed by 2% Lignocaine with 1:100000 adrenaline infiltration just anterior to the attachment of middle

meatus in the agger nasi area, in the anterior part of the middle meatus and uncinate is done.

PROCEDURE

With a Rosen's knife, nasal mucosa is incised at or just posterior to the lacrimal ridge and a flap of mucoperiostium is raised over the maxillary and lacrimal bone. The exact location of the lacrimal sac is ascertained by passing a fibreoptic light fibre through one of the canaliculus and into the lacrimal sac. The thin bone overlying the sac is removed by means of a chisel or burr (microdrill) or Kerrison's punch [19]. Once medial wall of the sac is exposed, it is incised vertically with the Sickle knife and then removed completely by means of a Blakesley Wilde forceps. Stenting of the neo-ostium may be done with the Silicon tube [20]. Wide removal of the medial wall of the sac followed by meticulous nasal irrigation and cleaning performed regularly is sufficient to prevent re-stenosis of the sac.

POST OPERATIVE MANAGEMENT

Syringing with antibiotic-steroid eyedrops, Oxymetazoline nasal drops 2-3 times a day for 2-3 weeks [21] and endoscopic cleaning of crusts after a week is performed.

COMPLICATIONS

Hemorrhage- severe bleeding is rare. Sometimes anterior ethmoidal or sphenopalatine artery is the cause of bleeding. These arteries may retract into the orbit after injury causing retro bulbar hematoma. Immediate treatment is lateral canthotomy.

Entry into orbit occurs during uncinectomy, if the sickle knife is turned laterally.

Sump syndrome- due to discrepancies in the height of the sac opening and nasal mucosal opening.

CSF leakage- common serious complication. Occurs at the site of the anterior attachment of the middle turbinate, which is avulsed, instead of being cut. The leak should be sealed with temporalis fascia or nasal mucosa from the middle turbinate kept in place by surgical pack which is left in place for five days. Patient is kept in head elevated position under broad spectrum systemic antibiotics.

Diplopia –due to damage to the medial rectus muscle

Synechiae formation- due to the raw area formation and is an important cause of late failure of surgery

Injury to periorbita.

ADVANTAGES

Aesthetic, with no damage to lacrimal pump mechanism and medial palpebral ligament [28], minimal intra operative bleeding and post operative pain and edema leading to low morbidity and early rehabilitation.

AIM OF THE STUDY

To compare the surgical outcome of external and endonasal dacryocystorhinostomy in terms of success rate and comfort level of the patient (i.e. pain and edema in the immediate post operative period).

MATERIALS AND METHODS

A prospective study was carried out on 100 patients, of whom 52 underwent external dacryocystorhinostomy and 48 underwent endonasal dacryocystorhinostomy at the Regional Institute Of Ophthalmology, Chennai from June 2008 to July 2009.

SELECTION CRITERIA

100 patients (72 females and 28 males) were included in the study.

They were in the age group 16-60.

None of them had any major systemic illness, like diabetes or hypertension.

All were diagnosed as dacryocystitis and all were primary DCRs.

EXCLUSION CRITERIA

Patients with canalicular and common canalicular obstruction were excluded from the study.

Age less than 16 years and more than 60 years

Suspicious lacrimal sac malignancies

CLINICAL EVALUATION

History and examination in detail was carried out in all cases of epiphora /discharge/swelling in the sac region.

The diagnosis of dacryocystitis was made clinically by the regurgitation test , (punctual reflux of mucopurulent discharge on compression) and lacrimal syringing (simple or mucopurulent discharge through the opposite punctum).

Medial canthal area assessment for inflammation, fistulae or swelling. Slit lamp examination was done to exclude diseases of the anterior segment. Other tests done were Schirmers test to rule out dry eye and a diagnostic nasal endoscopy to rule out nasal pathology.

INVESTIGATIONS DONE

Blood –hemogram, blood sugar ,bleeding and clotting time

Urine –albumin, sugar and deposits

X ray lacrimal sac region

Blood pressure

SURGICAL DETAILS AND POST OPERATIVE MANAGEMENT

52 patients underwent standard external DCR and 48 patients underwent endonasal DCR. All patients were operated under local anesthesia, by different surgeons.

STANDARD EXTERNAL DCR- PROCEDURE (Fig. 20)

Nasal packing with 4% lignocaine with adrenaline (1:100000) was done 15 mins prior to surgery and infiltration anaesthesia using 2% lignocaine with adrenaline over the sac region, blocking the infratrochlear and infraorbital nerves, was used.

Skin incision-curvilinear incision of 1.5-2 cm is made with 11 blade bard parker knife about 5 mm from the medial canthus ,just above the level of the medial canthal tendon.

Orbicularis muscle is separated and Muller's self retaining hemostatic retractor is applied. Medial palpebral ligament is cut at its periosteal attachment and sac and anterior lacrimal crest are identified. Periosteum is elevated and laterally rotated along with the sac using Freer's periosteal elevator.

Creation of ostium,with/without anterior ethmoidectomy - Osteotomy is done at the junction of the thin lacrimal and thick maxillary bone with the periosteal elevator and this is enlarged with a Citelli's punch forceps to make an osteum of atleast 10 mm diameter extending anteroposteriorly to the lacrimal crest, superiorly to the level of the upper part of the sac and below upto the naso lacrimal duct opening.[30].

Creation and suturing of mucosal flaps- anterior and posterior flaps are created from the sac and nasal mucosa by 'H' shaped incisions and the anterior flaps are sutured using 5-0 catgut. Incision is sutured in layers after securing hemostasis and dressing applied.

ENDONASAL DCR – PROCEDURE (Fig. No. 21)

A careful pre operative assessment was done for all 48 patients. Intranasal packing with 4% lignocaine with adrenaline (1:100000) was done 15 mins prior to surgery and infiltration anaesthesia using 2% lignocaine with adrenaline was done just anterior to the attachment of the middle meatus in agger nasi area, just in front of the uncinate process.

A horizontal incision, about 10 to 15mm just anterior to the attachment of middle turbinate and in front of the uncinate process.is made with the sickle knife. A second horizontal incision lower down commencing from the uncinate process at the level of the attachment of inferior turbinate is made and a vertical incision joining the two previous incisions is made.The mucosal flap is raised posteriorly and excised with scissors to expose the bone overlying the sac, which is removed by Kerrison's punch.

Once medial wall of the sac is exposed, it is incised vertically with the Sickle knife and then removed completely by means of a Blakesley Wilde forceps. Stenting was not done in any of our patients. Wide removal of the medial wall of the sac, and placement of nasal mucosal flaps over the ostium, followed by meticulous nasal irrigation and cleaning performed regularly is sufficient to prevent re-stenosis of the sac.

POST OPERATIVE CARE

In both sets of patients, post operatively, nasal pack was removed after 4-6 hours and hemostasis confirmed. Oxymetazoline nasal drops to clear residual blood clots and keep nasal cavity moist was used and follow up syringing of naso lacrimal duct with antibiotic-steroid drops to minimize inflammation and granulation tissue was done.

Verbal pain and edema score (0-3), where 0 represented nil pain/edema, 1-mild pain/edema, 2- moderate pain/ edema and 3 stood for severe pain /edema, was used to assess immediate post operative pain and edema.

Regular follow up of patients was done on day 1, 1 week, 1month, 3 months and 6 months, and anatomic patency confirmed by syringing of naso lacrimal duct (Fig. 22 and 23).

A successful outcome constituted both anatomic patency of the nasolacrimal duct and symptomatic relief.

OBSERVATION AND ANALYSIS

100 patients were included in the study, of which 52 underwent external DCR and 48 underwent endonasal DCR.

Age of the patients range from 16-60 years. Mean age of the patients was 42.25 years in external DCR and 34.08 years in endonasal DCR.

28 patients were males and 72 were females.

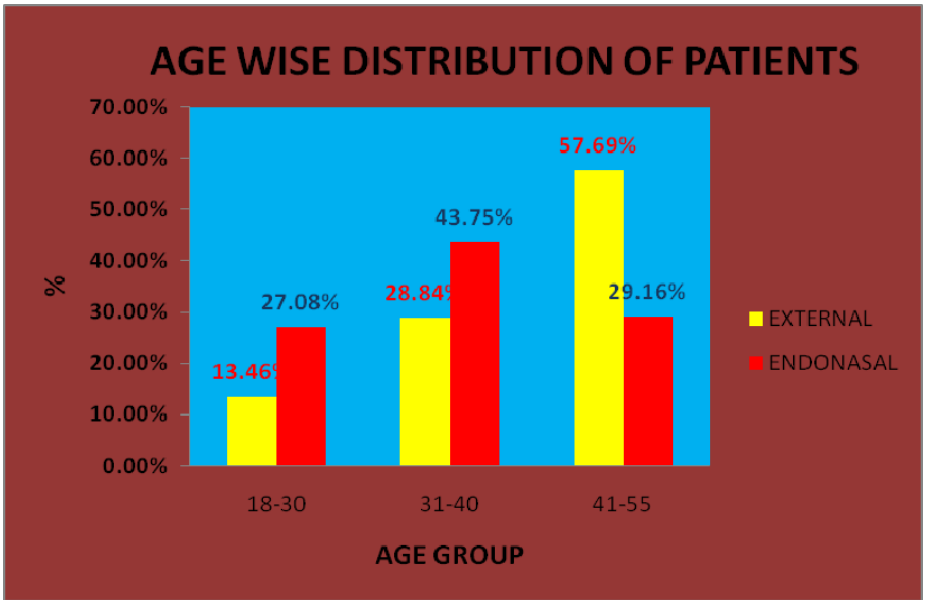
Duration of symptoms ranged from 2 -36 months.

STATISTICS IN OUR STUDY

Age wise distribution of patients in our study;

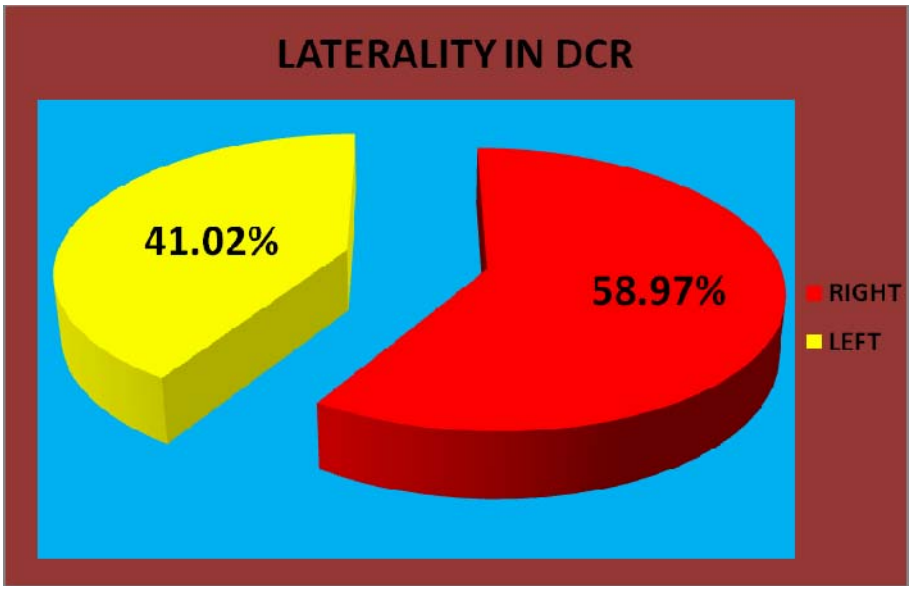
Age group	No of patients	
	Ext DCR	Endo DCR
16-30	7 (13.46%)	13 (27.08%)
31-40	15 (28.84%)	21(43.75%)
41-60	30 (57.69%)	14 (29.16%)

With a maximum incidence occurring around 55 years for external DCR and around 32 years for endonasal DCR.



LATERALITY

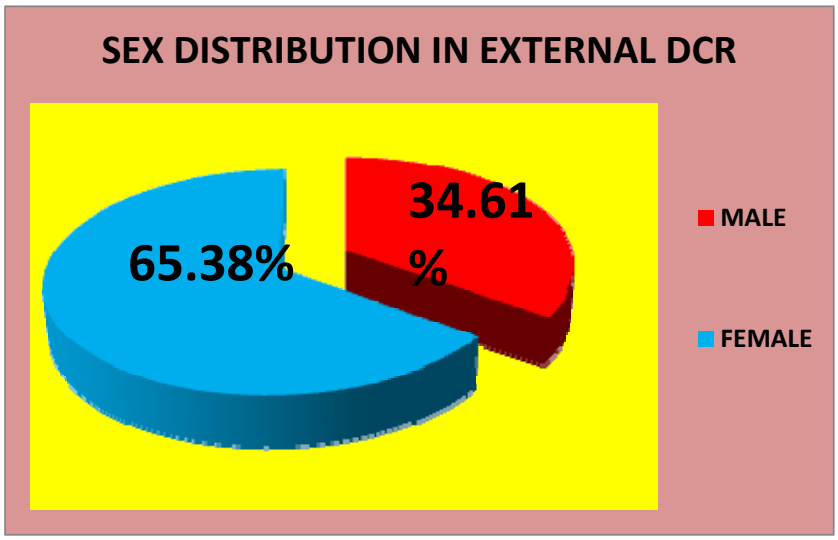
	RIGHT	LEFT
EXTERNAL DCR	31 (59.61%)	21 (40.38%)
ENDONASAL DCR	28 (58.33%)	20 (41.66%)

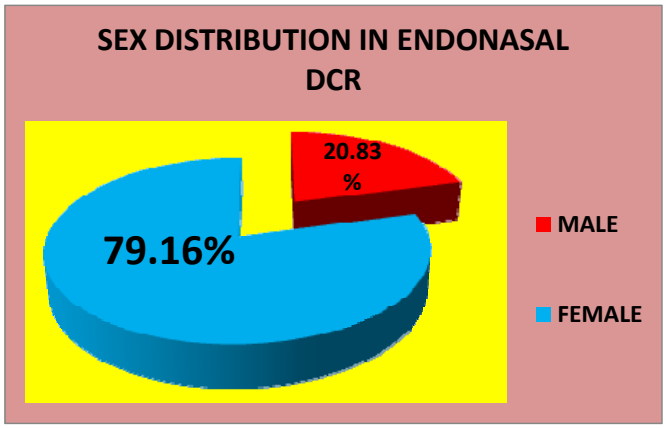


In most of our patients symptoms were seen more on the RIGHT side.

SEX DISTRIBUTION

	MALE	FEMALE
EXTERNAL DCR	18 (34.61%)	34 (65.38%)
ENDONASAL DCR	10 (20.83%)	38 (79.16%)





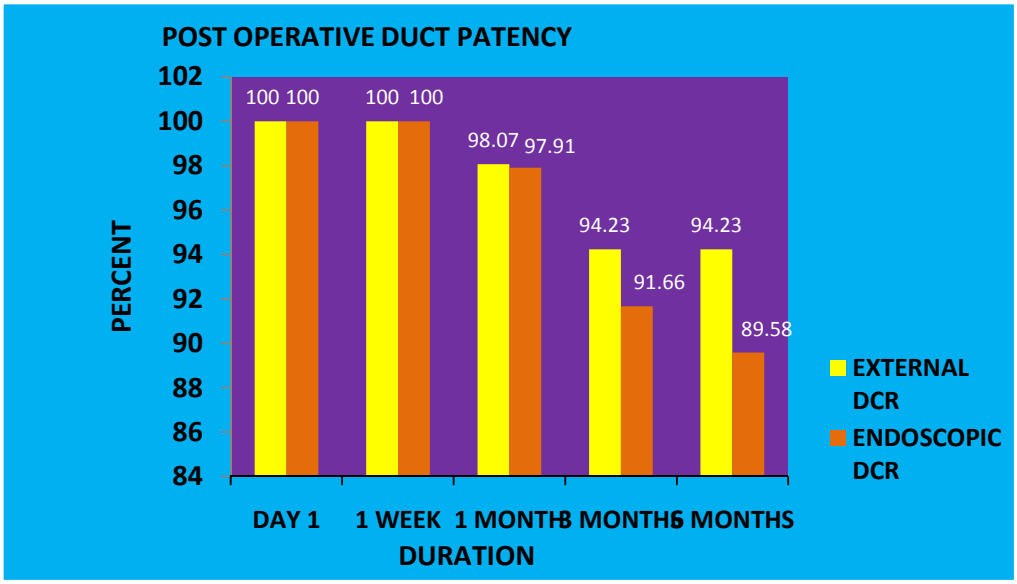
FOLLOW- UP

On the first and second follow up, i.e. on day 1 and end of the first week, all patients of the external DCR group had patent naso lacrimal ducts, while 1 patient of the endonasal group had mucopurulent regurgitation, and she was treated with meticulous antibiotic- steroid syringing on alternate days till duct became patent.

At the end of the first month follow up, 51(98.07%) of 52 patients of the external DCR group and 47(97.91%) of the endonasal group had patent naso lacrimal ducts, while 1 patient of the endonasal group was lost to follow up.

On the 3 rd month follow up there were 2 drop outs each in both groups. Others were found to have patent ducts(94.23% -external DCR and 91.66% - endonasal DCR).

At the end of six months, 2 more were lost to follow up. 48 (94.23%) of the 52 of group 1 had patent ducts, while 2 patients of group 2 had blocked ducts giving an outcome percentage of 89.58% in the endonasal group. Both patients with blocked ducts showed fibrous adhesions on diagnostic endoscopy and were subjected to revision surgery.

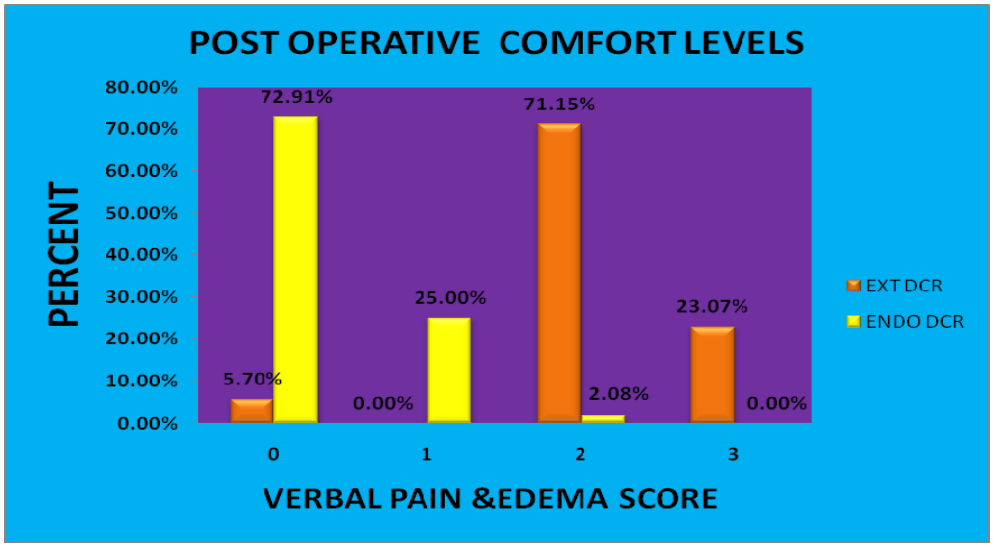


POST OPERATIVE DUCT PATENCY

	EXTERNAL DCR	ENDOSCOPIC DCR
END OF 1 WEEK	(52) 100%	(48) 100%
END OF 1 MONTH	(51) 98.07%	(46) 97.91%
END OF 3 MONTHS	(49) 94.23%	(44) 91.66%
END OF 6 MONTHS	(48) 94.23%	(43) 89.58%

Regarding immediate post operative pain and edema (day 1), 37(71.15%) patients of group 1experienced a verbal pain and edema score of 2, while 12 (23.07%) patients gave a score of 3 and 3 (5.7%) were relatively pain free.

In the endonasal group, almost all the patients had pain and edema score of less than 2, 12 (25%) patients gave a score of 1, and 29 (60.41%) gave a score of 0 and 1 (2.08%) gave a score of 2.



COMPLICATIONS

INTRA OPERATIVE COMPLICATIONS

	EXTERNAL DCR	**ENDONASAL DCR**
HEMORRHAGE	2 (3.84%)	-
INJURY TO MEDIAL CANTHAL STRUCTURES	-	-
INJURY TO CORNEA	--	-
INJURY TO ORBITA/PERIORBITA	-	-
CSF LEAKAGE	-	-

IMMEDIATE POST OPERATIVE COMPLICATIONS

	EXTERNAL DCR	**ENDONASAL DCR**
LOCAL INFECTION	-	-
SUBCUTANEOUS EMPHYSEMA	-	-
EPISTAXIS	1 (1.90%)-	1 (2.08%)-
CSF LEAKAGE	-	-

LATE POST OPERATIVE COMPLICATIONS

	EXTERNAL DCR	**ENDONASAL DCR**
OSTIAL CLOSURE	-	2 (4.16%)
SUMP SYNDROME	-	-
SCARRING	1 (1.90%)	-
CANALICULAR STENOSIS	-	-

Intraoperative bleeding was managed by adrenaline nasal packs. 2 patients with late ostial closure due to adhesions underwent revision surgery after release of adhesions.

COMPARATIVE ANALYSIS

EXTERNAL DCR	ENDONASAL DCR
EXELLENT OUTCOME (90-95%)	GOOD OUTCOME (85-90%)
COST EFFECTIVE	COMPARATIVELY EXPENSIVE
SHORT LEARNING CURVE	STEEP LEARNING CURVE
SHORTER OPERATING TIME	PROLONGED OPERATING TIME
BLEEDING, PAIN AND EDEMA MORE	COMPARATIVELY LESS
EXTERNAL SCAR PRESENT	COSMETICALLY ACCEPTABLE
REVISION SURGERY DIFFICULT	REVISION SURGERY EASIER
BILATERAL SURGERY NOT POSSIBLE AT SAME SITTING	BILATERAL SURGERY POSSIBLE
NOT POSSIBLE IN ACUTE CONDITIONS	POSSIBLE IN ACUTE CONDITIONS

DISCUSSION AND RESULTS

- Females had a higher incidence of dacryocystitis, when compared to males.
- Dacryocystitis was more common on the right side.
- Endonasal DCR was the preferred modality of surgery in the younger age group due to its cosmesis.
- Bleeding was relatively higher in external DCR(5.76%), than in endonasal DCR (2.08%).
- The average operating time was found to be lesser in external DCR, averaging 30 minutes, while it ranged from 45 to 60 minutes in endonasal DCR.
- The success of the surgery was determined by a patent nasolacrimal duct on lacrimal irrigation and symptomatic relief to the patient.

The **success rates** at the end of 6 months, was 94.23% for **external DCR** which compares favourably with

- Studies by R K Bansal et al, at the Department of Ophthalmology, Govt. Medical College, Chandigarh, with a success rate of 95% in external DCR and

- Comparative study of external and endonasal DCR, (IJO & Head and Neck Surgery,Vol 52, No 1/ Dec 99), with a success rate of 93% in external DCR.

The **success rates** at the end of 6 months was 89.58% for **endonasal DCR,** which is slightly lower than that seen in studies conducted by

- Tsirbas and Wormald with a success rate of 95% and

- Comparative study of external and endonasal DCR, (IJO & Head and Neck Surgery,Vol 52, No 1/ Dec 99), with a success rate of 100% in endonasal DCR.

This could be attributed to the fact that stents were not used in any of our patients, mucosal flaps were not sutured, and that we are still in the learning curve.

- A pre operative diagnostic nasal endoscopy goes a long way in improving the results of endonasal surgery.

The **comfort levels** of the patient in terms of immediate post operative pain and edema (day 1),was significantly better in the endonasal group (98%) when compared to the external group.

CONCLUSION

- Both procedures had comparable results, with external DCR scoring a higher success rate as against endoscopic DCR.

- The comfort levels of the patient in terms of immediate post operative pain and edema (day 1), was significantly better in the endonasal group %) when compared to the external group.

However, a systematic and holistic approach is mandatory in all cases of watering, and the mode of surgery is tailored to the patient's individual needs and the surgeon's expertise.

EXTERNAL DACRYOCYSTORHINOSTOMY

Sl. No	Name	Age/ Sex	Occu	IP/OP	C/O	Side	Duration	DOS	Comp	Follow up									Result
										Duct patency					*Comfort level (day1)				
										Day1	1 wk	1 mth	3 mths	6 mths	0	1	2	3	
1	Kullamal	50/F	HW	35752	W/D	R	1 y	9.6.08	-	+	+	+	+	+			✓		S
2	Saroja	43/F	HW	39475	W	R	3 m	23.6.08	-	+	+	+	+	+					S
3	Soleni	55/F	HW	52002	W	R	6 m	7.7.08	B	+	+	+	+	+			✓		S
4	Ponnamal	40/F	C	37591	W/D	L	6 m	28.7.08	-	+	+	+					✓		D
5	Thangamal	55/F	HW	58337	W/D	R	1 yr	4/8/08	-	+	+	+	+	+			✓		S
6	Manikandan	45/M	C	49054	W	L	8 m	4/8/08	-	+	+	+	+	+			✓		S
7	Akilandam	50/F	HW	53333	W	R	7 m	11/8/08	-	+	+	+	+	+		✓			S
8	Farakdulla	55/M	C	56935	W	R	I yr	11/8/08	-	+	+	+	+	+			✓		S
9	Padma	38/F	C	43530	W	R	6 m	1/9/08	-	+	+	+	+	+		✓			S
10	Chittibabu	31/M	C	64998	W/D	L	3 m	8/9/08	-	+	+	+	+	+			✓		S
11	Palani	25/M	C	64319	W	R	7 m	8/9/08	-	+	+	+	+	+					S
12	Andal	55/F	HW	55924	W	R	1 yr	8/9/08	-	+	+	+	+	+			✓		S
13	Muthaiya	42/M	C	60900	W/D	R	4 m	22/9/08	-	+	+	+	+	+			✓		S
14	Vimala	30/F	C	430223	W	R	10 m	22/9/08	-	+	+	+	+	+					S
15	Krishnaveni	38/F	HW	61535	W	L	7 m	6/10/08	B	+	+	+	+	+				✓	S
16	Ajirabee	32/F	HW	65597	W/D	L	6 m	6/10/08	-	+	+	+	+	+			✓		S
17	Pandian	32/M	C	74450	W/D	R	8 m	20/10/08	-	+	+	+	+	+			✓		S
18	Muthammal	50/F	C	69915	W	L	9 m	10/11/08	-	+	+	+	+	+				✓	S
19	Dhanabakyam	24/F	S	69334	W	R	8m	17/11/08	-	+	+	+	+	+			✓		S
20	Lakshminarayan	46/F	HW	431949	W/D	L	1 yr	17/11/08	-	+	+	+	+	+			✓		S
21	Malliga	40/F	HW	75017	W	R	9 m	1/12/08	-	+	+	_	_	_			✓		F
22	Pandian	50/M	HW	64296	W/D	L	4m	1/12/08	-	+	+	+	+	+			✓		S
23	Malathy	39/F	C	75283	W	R	11m	1/12/08	-	+	+	+	+	+					S
24	Selvamary	35/F	HW	82369	W	L	6m	8/12/08	-	+	+	_	+	+				✓	S
25	Ramalingam	40/M	C	84989	W	R	2 y	22/12/08	-	+	+	+	+	+			✓		S
26	Yagal	33/M	C	85619	W	R	5 m	22/12/08	-	+	+	+	+	+				✓	S
27	Lakshmi	55/F	HW	77927	W	R	6 m	22/12/08	-	+	+	+	+	+			✓		S
28	Duraisamy	45/M	C	75866	W/D	R	1 yr	12/1/09	-	+	+	+						✓	D
29	Pushpak	23/M	S	57220	W	L	5 m	12/1/09	-	+	+	+	+	+			✓		S
30	Nirmala	54/F	HW	433549	W	L	3 m	29/1/09	B	+	+	+	+	+			✓		S
31	Jothi	45/F	HW	434505	W/D	R	2 yrs	16/2/09	-	+	+	+	+	+		✓			S

32	Vanaja	51/F	HW	99321	W/D	R	8 m	23/2/09	-	+	+	+	+	+			✓		S
33	Lakshmi	33/F	C	72213	W	R	3 m	23/2/09	-	+	+	+	+	+			✓		S
34	Amdi	44/F	C	10376	W/D	R	9 m	23/2/09	-	+	+	+	+	+				✓	S
35	Saraswathi	55/F	HF	12499	W	L	10 m	23/3/09	-	+	+	+	+	+					S
36	Pitchandi	43/M	C	16504	W/D	R	11 m	6/4/09	-	+	+	+	+	+				✓	S
37	Yasodha	55/F	HW	23523	W	R	1yr	27/4/09	-	+	+	+	+	+					S
38	Kumari	35/F	HW	15809	W	L	5 m	27/4/09	-	+	+	+	+	+				✓	S
39	Govindan	42/M	C	41547	W	L	2 yrs	27/4/09	-	+	+	+	+	+				✓	S
40	Venuka	22/F	C	23528	W	L	10 m	4/5/09	-	+	+	+	+	+					S
41	Anishabi	37/F	HW	27881	W	R	4 m	11/5/09	-	+	+	+	+	+			✓		S
42	Kumar	35/M	C	25345	W/D	L	3 m	11/5/09	-	+	+	+	+	+			✓		S
43	Muniammal	43/F	HW	26147	W	L	1 yr	11/5/09	-	+	+	+	+	+			✓		S
44	Saroja	22/F	C	17436	W	L	8 m	18/5/09	-	+	+	+	+	+			✓		S
45	Mahesh	29/M	C	24564	W	R	4 m	1/6/09	-	+	+	+	+	+				✓	S
46	Nagaraj	46/M	C	24763	W	R	9 m	8/6/09	-	+	+	+	+	_			✓		D
47	Prem	34/M	HW	32688	W	R	3 m	8/6/09	-	+	+	+	+	+			✓		S
48	Dilliammal	54/F	HW	16843	W/D	L	8 m	15/6/09	-	+	+	+	+	+				✓	S
49	Lakshmi	50/F	C	36987	W	L	1 y	15/6/09	-	+	+	+	+	+			✓		S
50	Rani	38/F	HW	39210	W	L	5 m	22/6/09	-	+	+	+	+	+			✓		S
51	Jeyaraj	47/M	C	42236	W	R	6 m	22/6/09	-	+	+	+	+	+			✓		S
52	Baby	32/F	HW	23109	W	R	1y	29/6/09	-	+	+	+	+	+				✓	S

*comfort level-pain and edema on 1 st post operative day rated on a verbal pain score ranging from 0 -3, where

0=no pain/ edema

1=mild pain/edema

2=moderate pain/edema

3=severe pain/edema

ENDONASAL DACRYOCYSTORHINOSTOMY

Sl. No	Name	Age/ Sex	Occu	IP/OP	C/O	Side	Dur	DOS	comp	Follow up									Result
										Duct patency					*Comfort level (day1)				
										Day1	1 wk	1 mth	3 mths	6 mths	0	1	2	3	
1	Antonyammal	33/F	HW	37360	W	L	6 m	9/6/09	-	+	+	+	+	+	✓				S
2	Padmavathy	35/F	HW	33125	W	R	10 m	9/6/08	-	+	+	+	+	+	✓				S
3	Jothi	18/F	S	35871	W	L	5 m	23/6/08	-	+	+	-	+	+	✓				S
4	Banu	42/F	C	9441	W	L	1 y	23/6/08	-	+	+	+				✓			D
5	Pournami	23/F	S	39434	W	R	5 m	30/6/08	-	+	+	+	+	+		✓			S
6	Shanthi	24/F	H	29226	W/D	R	7 m	30/6/08	-	+	+	+	+	+	✓				S
7	Padmini	43/F	C	43917	W/D	L	6 m	7/7/08	-	+	+	+	+	+		✓			S
8	Rakiya	38/F	HW	43965	W	R	9 m	7/7/09	-	+	+	+	+	+	✓				S
9	Janaki	19/F	S	37902	W	R	5 m	7/7/08	-	+	+	+	+	+	✓				S
10	Sheriff	26/M	C	50392	W/D	L	2 y	7/7/08	-	+	+	+	+	+	✓				S
11	Sarala	32/F	HW	42147	W	R	7 m	21/7/08	-	+	+	+	+	+	✓				S
12	Neela	45/F	HW	45871	W/D	L	11 m	21/7/08	B	+	+	+	+	+		✓			S
13	Datchayini	32/F	HW	49558	W	L	8 m	28/7/08	-	+	+	+	+	+	✓				S
14	Saraswati	42/F	HW	63440	W	L	10 m	4/8/08	-	+	+	+	+	+			✓		S
15	Sarala	32/F	C	47214	W	R	5 m	11/8/08	-	+	+	_			✓				D
16	Kasi	38/M	C	429372	W	R	2y	1/9/08	-	+	+	+	+	+	✓				S
17	Muniamal	41/F	C	55779	W/D	R	1y	1/9/08	-	+	+	+	+	+	✓				S
18	Lakshmi	38/F	HW	53763	W/D	R	7 m	1/9/08	-	+	+	+	+	+	✓				S
19	Sumathi	34/F	C	55447	W	R	3 y	8/9/08	-	+	+	+	+		✓				S
20	Prakash	35/M	C	29965	W	L	5 m	8/9/08	OC	+	+	+	+	_	✓				F
21	Luciamary	38/M	HW	59411	W	R	9 m	22/9/08	-	+	+	+	+	+	✓				S
22	Latha	43/F	C	59401	W	R	11 m	22/9/08	-	+	+	+	+	+	✓				S
23	Seema	25/F	S	39531	W/D	L	8 m	22/9/08	-	+	+	+	+	+	✓				S
24	Malathy	23/F	S	61903	W/D	R	6 m	6/10/08	-	+	+	+	+	+	✓				S

25	Saraswati	34/F	C	41237	W	R	9 m	6/10/08	-	+	+	+	+	+	✓				S
26	Victoria	45/F	HW	67068	W	L	11 m	20/10/08	-	+	+	+	+	+	✓				S
27	Shanmuga	43/M	C	60248	W	R	8 m	10/11/08	-	+	+	+	+	+	✓				S
28	Maheswari	23/F	S	63891	W/D	R	2 y	10/11/08	-	+	+	+	+	+		✓			S
29	Thilaga	24/F	HW	69882	W	L	4 m	17/11/08	-	+	+	+	+	+	✓				S
30	Jayamani	42/M	C	72621	W	R	9 m	17/11/08	-	+	+	+	+	+	✓				S
31	Seenu	43/M	C	56630	W	R	8 m	24/11/08	-	+	+	+	+	+	✓				S
32	Valli	41/F	HW	67093	W/D	R	11 m	24/11/08	OC	+	+	+	+	_	✓				F
33	Alagamal	46/F	HW	73599	W/D	L	8 m	8/12/08	-	+	+	+	+	+	✓				S
34	Shanti	24/F	HW	71313	W/D	R	6 m	8/12/08	-	+	+	+	+	+		✓			S
35	Maheswari	37/F	HW	63881	W	L	9 m	8/12/08	-	+	+	+	+	+	✓				S
36	Merlin	32/F	HW	75699	W	R	2 y	8/12/08	-	+	+	+	+	+	✓				S
37	Shanthi	21/F	S	73214	W	L	6 m	15/12/08	-	+	+	+	+	+		✓			S
38	Jahoba	45/F	C	73807	W/D	L	3 y	15/12/08	-	+	+	+		+	✓				D
39	Unamalai	45/F	HW	785675	W	R	9 m	15/12/08	-	+	+	+	+	+		✓			S
40	Selvam	20/M	S	70721	W	R	5 m	15/12/08	-	+	+	+	+	+	✓				S
41	Mageswari	32/F	C	77838	W	L	12 m	22/12/08	-	+	+	+	+	+	✓				S
42	Mallik	40/M	HW	432086	WD	L	6 m	12/1/09	-	+	+	+	+	+		✓			S
43	Mythili	33/F	HW	1232	W	R	7 m	16/2/09	-	+	+	+	+	+		✓			S
44	Mohammed	40/M	C	6393	W	L	1 y	23/2/09	-	+	+	+	+	+		✓			S
45	Madhavi	33/F	C	7149	W/D	R	10 m	23/3/09	-	+	+	+	+	D	✓				D
46	Kannagi	32/F	C	11835	W	L	9 m	6/4/09	-	+	+	+	+	+	✓				S
47	Vijaya	32/F	HW	23590	W	R	6 m	4/5/09	-	+	+	+	+	+	✓				S
48	Devi	30/F	C	33173	W	R	8 m	1/6/09	-	+	+	+	+	+		✓			S

*comfort level-pain and edema on 1 st post operative day rated on a verbal pain score ranging from 0 -3, where

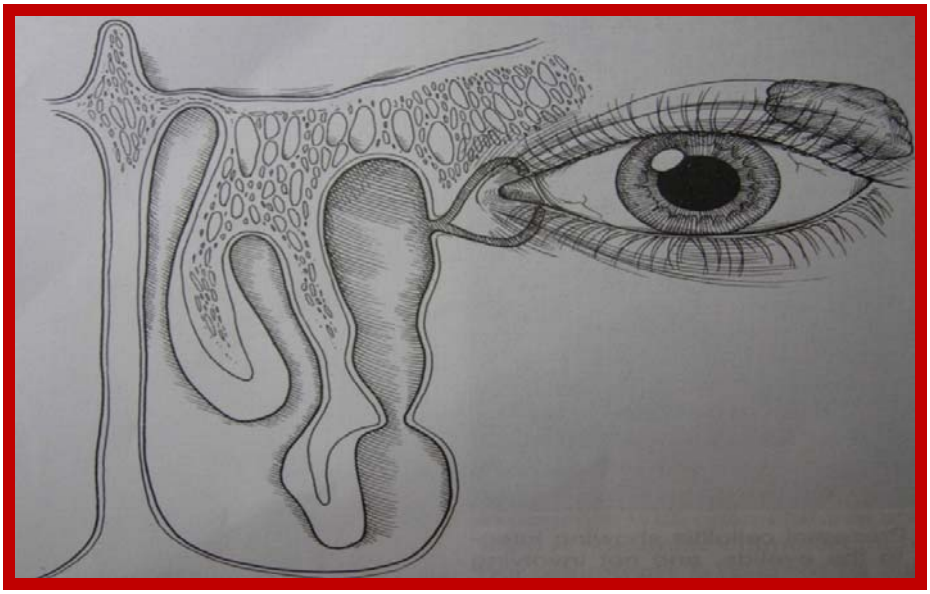
0=no pain/ edema

1=mild pain/edema

2=moderate pain/edema

3=severe pain/edema

FIG. 1 - DUPUY DUTEMPS



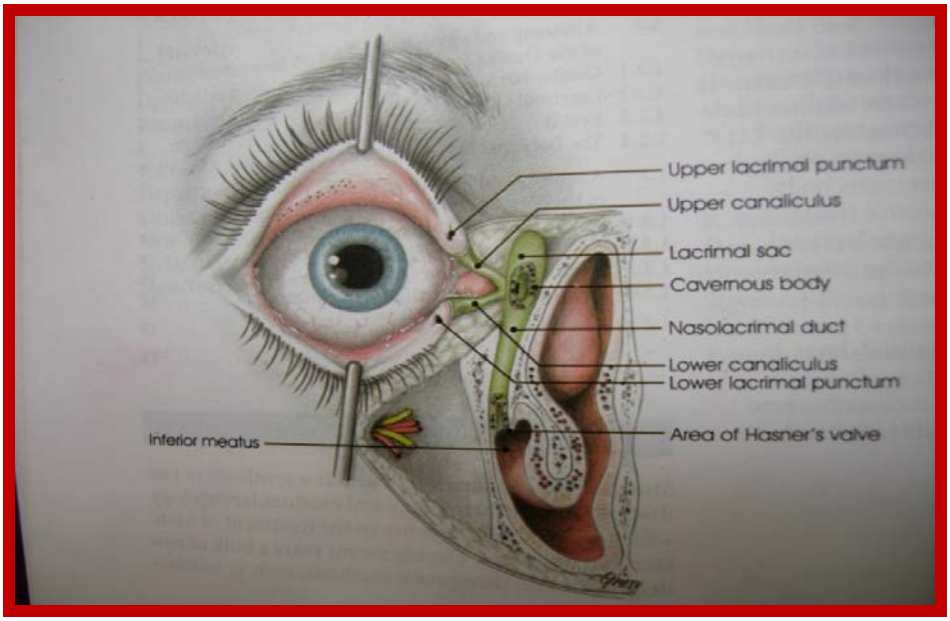


FIG. - 2 AND 3 SHOWING ANATOMY AND RELATIONS OF THE LACRIMAL SYSTEM

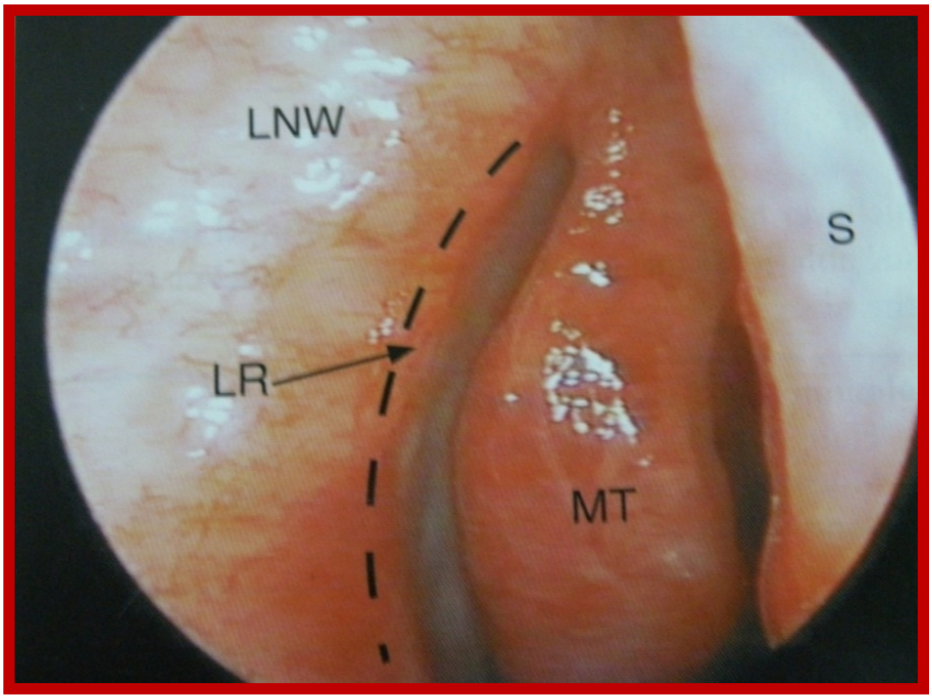


FIG. 4 - ENDOSCOPIC ANATOMY OF THE NOSE –SAC AREA

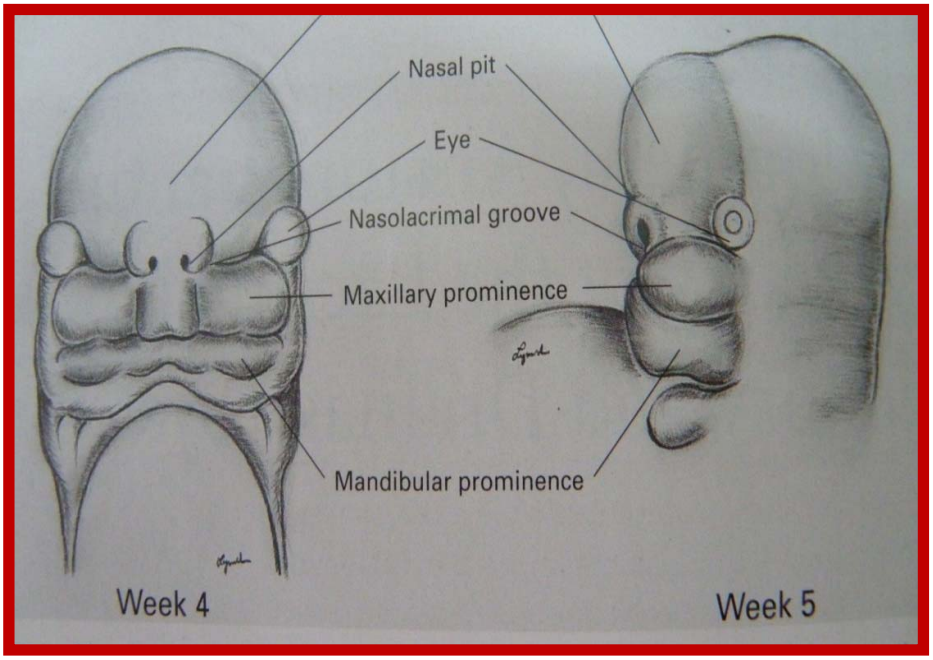
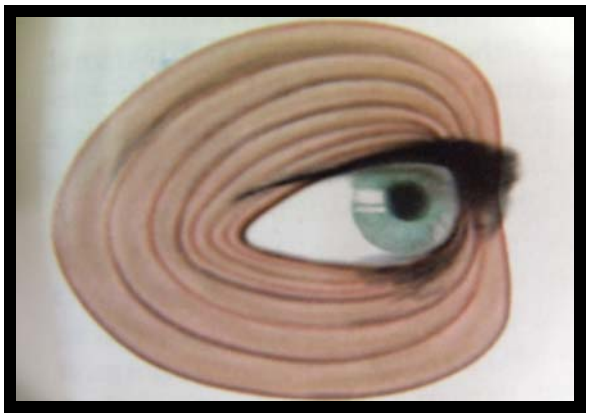
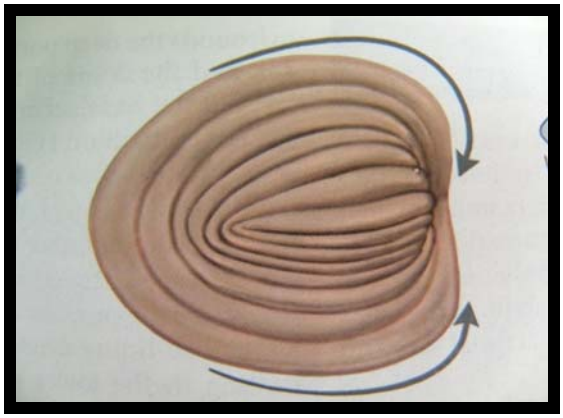


FIG. 5 - DEVELOPMENT OF THE LACRIMAL SYSTEM





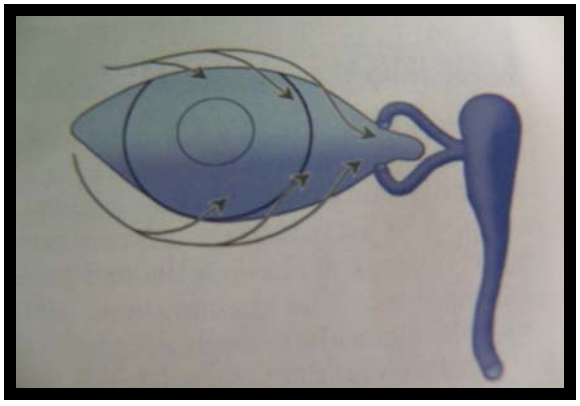


FIG. 6 - TEAR FILM DYNAMICS

FIG. 7 - SCHIRMERS TEST

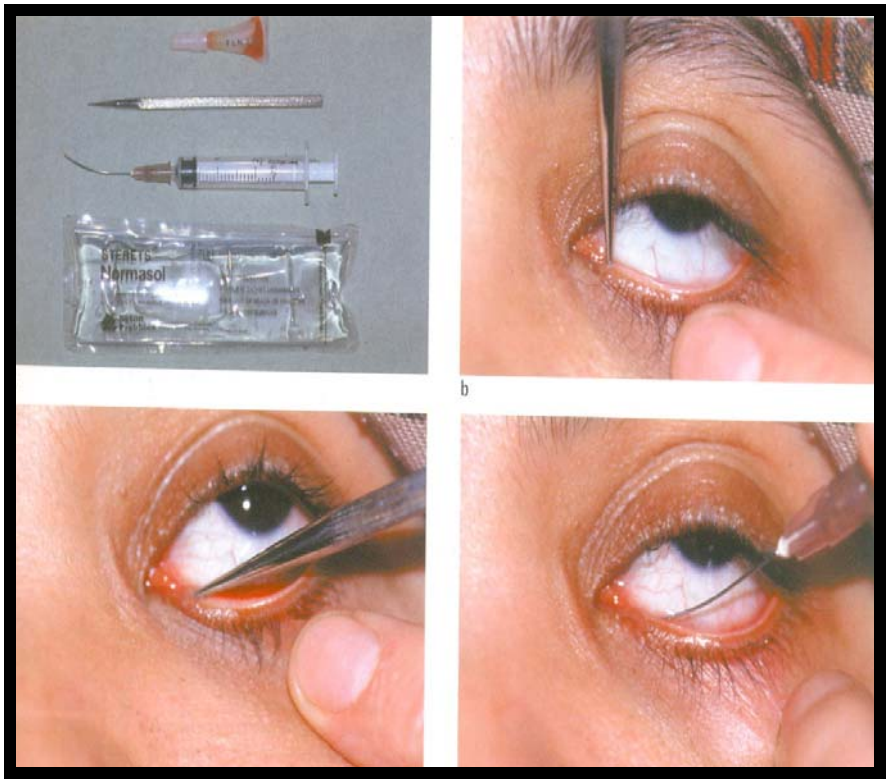


FIG. 8 - LACRIMAL PROBING AND SYRINGING

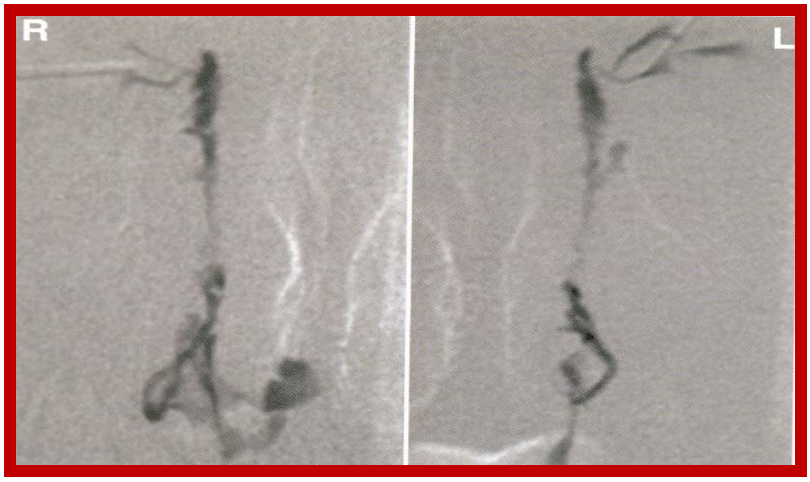


FIG. 9 - DACRYOCYSTOGRAPHY

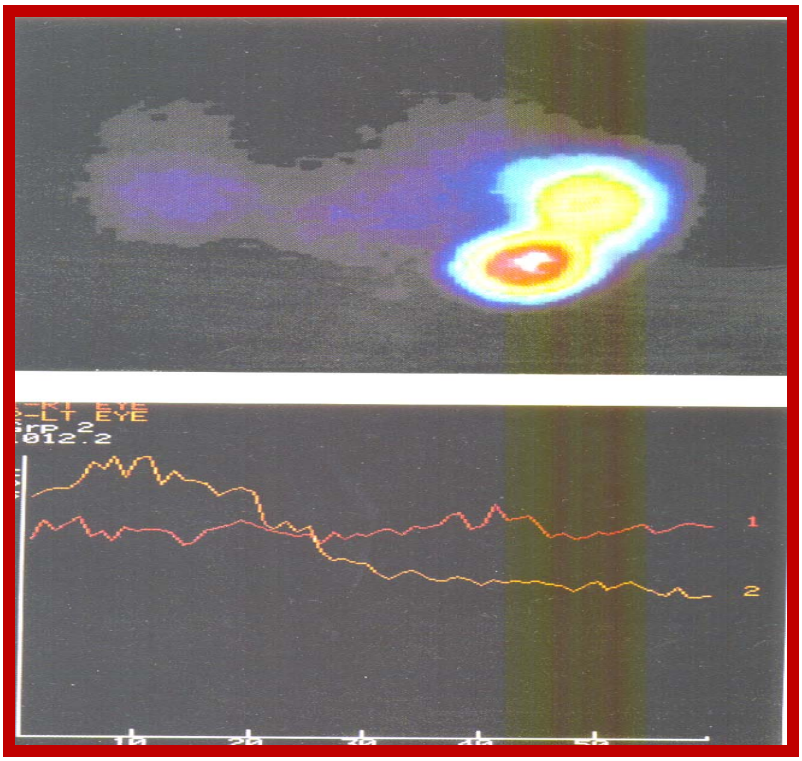


FIG. 10 - NUCLEAR LACRIMAL SCINTIGRAPHY

FIG. 11 - LACRIMAL ABSCESS

FIG. 12 - LACRIMAL FISTULA

FIG. 13 - ROPLAS POSITIVE

FIG. 14 - LACRIMAL SYRINGING THROUGH LOWER PUNCTUM

FIG. 15 - POSITION OF THE SURGEON AND INSTRUMENTATION

FIG. 16 - INSTRUMENTS USED IN ENDOSCOPIC DCR

30^0 NASAL ENDOSCOPE

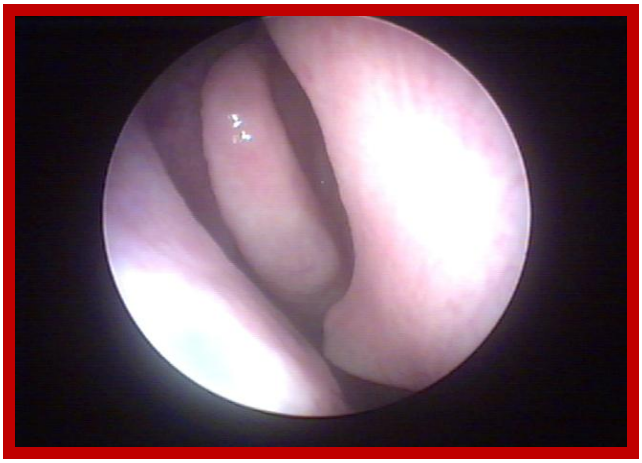


FIG 17 - SEPTAL DEVIATION

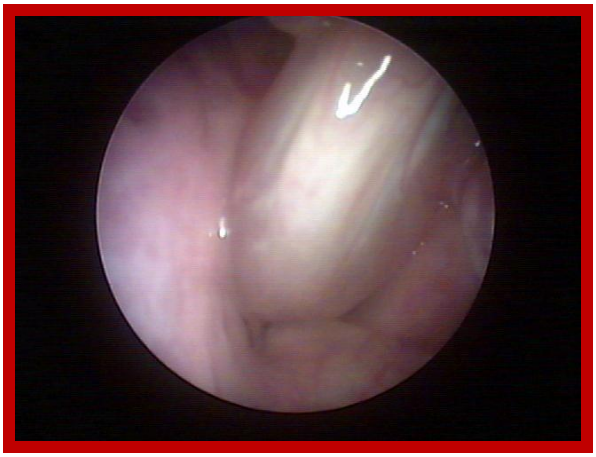
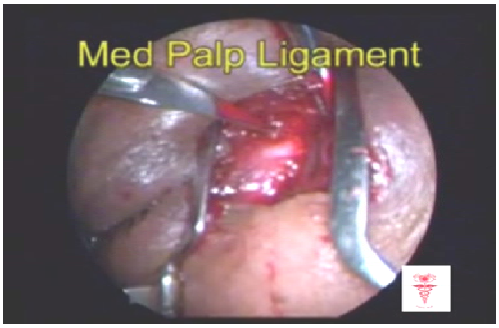
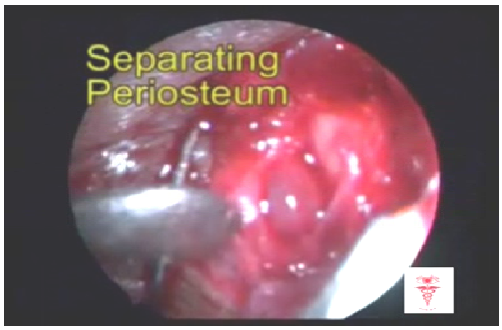


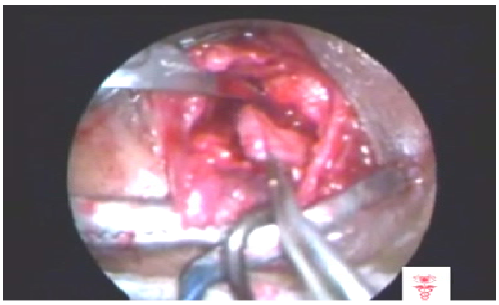
FIG 18 - MASS FLOOR OF THE NOSE

FIG. 19 - ETHMOIDAL POLYP

FIG.- 20 EXTERNAL DCR







ANTERIOR LIP OF NASAL MUCOSA

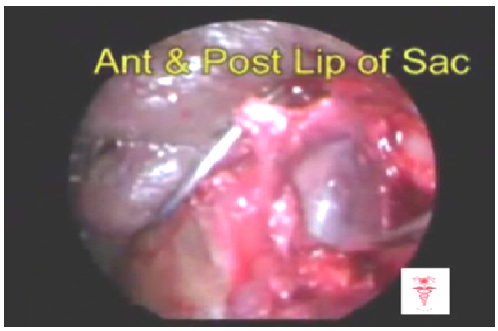
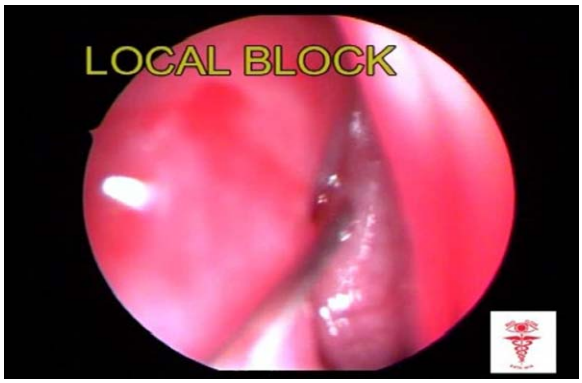
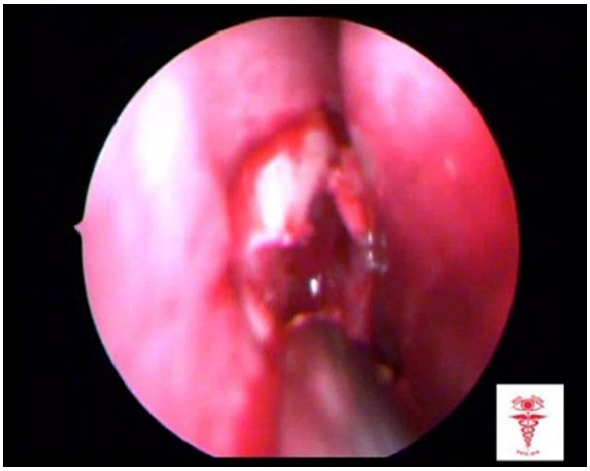


FIG. 21 - ENDONASAL DCR





BONE NIBBLING

FIG. 22 - ENDONASAL DCR- POST OPERATIVE DAY 1

FIG. 23 - EXTERNAL DCR-POST OPEATIVE, DAY 1 SHOWING MODERATE EDEMA

PROFORMA

SERIAL NO. **OP/IP NO.**

NAME AND ADDRESS

AGE/SEX

OCCUPATION **DOA DOS DOD**

PRESENTING COMPLAINTS & DURATION

Watering

Discharge

Swelling

Others

PAST HISTORY

Acute dacryocystitis

Nasal problems

Surgery/trauma

Drug allergy

Bleeding disorders/anticoagulant usage

EXAMINATION

NASAL

Tumour/polyp/hypertrophied turbinate/DNS

OCULAR

Lid abnormalities

Epiphora/ discharge

Swelling in sac region/tenderness

ROPLAS

PATENCY OF NASOLACRIMAL DUCT

CLINICAL DIAGNOSIS

INVESTIGATIONS

Hb TC DC ESR BT CT

Blood sugar

Urine- albumin/sugar/deposit

Blood pressure

X-ray lacrimal sac area

DIAGNOSTIC ENDOSCOPY

SURGERY – MODALITY AND DATE

External/endoscopic DCR

ANAESTHESIA

Local/General Anaesthesia

COMPLICATIONS

Intra operative/post operative

POST OPERATIVE FOLLOW UP

Pain & edema on day 1

Patency of nasolacrimal duct on Day 1, 1 week, 1 month, 3 months and 6 Months

OUTCOME